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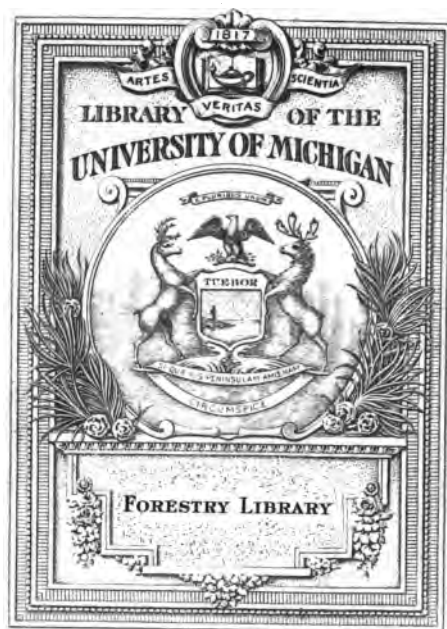
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A SYNOPSIS  
OF  
THE AMERICAN FIRS.

(*Abies* Link),

By DR. GEORGE ENGELMANN.

From the *Transactions of the Academy of Science of St. Louis*, Vol. III., No. 4.

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*A Synopsis of the American Firs (Abies Link.)\**

By Dr. GEORGE ENGELMANN.

Great confusion prevails in regard to the distinction of species of our Firs and in their synonymy. This is owing partly to the innate difficulty of the subject and to the very imperfect descriptions in the books, and partly to the inordinate zeal of seed collectors and horticulturists. But in the last decade the western mountain regions, the homes of most of our firs, have been more fully explored and the geographical limits of the species ascertained; and in about the same period the anatomical structure of their leaves has been investigated, and has furnished welcome aid in the distinction and the classification of the species.

It is a most interesting as well as significant fact that while the anatomical structure of the leaves of higher organized plants shows considerable uniformity, so that it rarely can be made available for diagnostic purposes, the conifers exhibit such a wonderful variety of leaf-structure (approaching thereby the lowest orders of vascular plants), that often a single leaf is sufficient to recognize the genus, and often the species, even when the ordinary characters may leave us in doubt.

The anatomy of coniferous leaves has been often examined into, but the first to appreciate their characters as a means of classification was F. Thomas, who in 1865 published an extensive treatise on the subject in Pringsheim's *Jahrb.* 4, pp. 23-63. He was followed in 1871 by C. E. Bertrand, *Bull. Soc. Bot. France*, 18, pp. 376-81. The same author gave a more elaborate paper on this subject in 1874 in *Ann. Sci. Nat. Bot.* 20, pp. 5-153, with 12 plates. He was followed in the succeeding year by W. R. McNab in *Proc. Irish Acad.* 2, pp. 209-13, with 1 plate; and in

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\* I follow Link (*Linnaea*, 15, 525, 1841) in his name, definition, and circumscription of the Genus, which seems to be a very natural one, comprising the silver or balsam firs. The synonym *Picea* Don, in *Loudon Arb.* 4, 2323, 1838, is the older name and enjoys the Linnean prestige, but is contrary to classical (Plinius, etc.) and philological authority. The name *Abies* is generally adopted on the continent of Europe, while *Picea* was heretofore principally used in England, but is now being abandoned. *Picea* Link (the same as *Abies* Don) is the proper name for the spruces. Tournefort, the elder DeCandolle, Gray and others, comprise under the name of *Abies* both firs and spruces. The generic distinctions between them are based both on the floral and fruit characters as well as on the leaf anatomy.

1877 the same published an exhaustive paper in the same journal, pp. 673-704, with 4 plates. E. Purkinje, of the Foresters' Academy of Weisswasser in Austria, made, four or five years ago, extensive investigations on the same subject, but has, I believe, not yet given his results to the public. My own studies in this line, commenced some fifteen years ago, when the conifers of the Rocky Mountains first got into the hands of botanists, have been carried on more assiduously within the last three years.

Highly important as the microscopic investigations of the leaf anatomy are, they have sometimes been relied on too exclusively, disregarding the characters furnished by the reproductive organs.\*

It may not be useless to repeat that the leaves of all firs are sessile with a circular base (leaving a circular scar in falling off), and without the prominent persistent ligneous cushion which is peculiar to the spruces. They are usually more or less flattened, grooved above and keeled below, and those of the branches are mostly twisted above the base so as to give them a more or less distichous direction; the leaves of the erect shoots are thicker and convex above, and not twisted. The tip of the leaves of young trees and of the lower branches of older ones is notched in almost all species; the leaves of robust shoots and of fertile branches are mostly entire, obtuse in some, acute in others.† All the leaves have stomata on the under side, arranged in a smaller or larger number of series, forming bands on each side of the keel. On the upper side of the leaf stomata are present in some, especially in those with thicker leaves, and absent in other species, mostly in those with flatter leaves; in several species the leaves of the lower or sterile branches are without stomata above, and the thicker ones of the upper or fertile branches have a few (in the upper part of the groove) or many. The thick epidermis of the upper surface is mostly underlaid and strengthened by very robust longitudinal cells, with thick walls and a very slender cavity,

\* The separation by Bertrand, followed by McNab, of *Abies nobilis* from the other firs, and the connecting it with *Pseudotsuga Douglasii*, notwithstanding their striking differences in pollen, fruit, and seed, must be considered as the result of such one-sided investigation.

† Hence the necessity of collecting, if possible, branches of a young tree, erect shoots, lower branches of older, fertile trees (the only specimens which we usually find in herbaria because easily attainable) and branches with male and such with female flowers, or with their vestiges; besides these, the cones and seeds and young seedling plants are important. A slice of the bark of old and of young trees ought to complete the material.

which have been named pseudo-bast cells, but are now generally known as hypoderm cells. They are almost always present on the edges and the keel of the leaf, there sometimes crowded in 3-5 layers, and they often form a more or less interrupted stratum on the upper side. Where stomata pierce the epidermis, the hypodermic stratum is incomplete, or entirely absent. Only in a few species (*A. bracteata* and *religiosa* and the Asiatic *firma*) we find such cells also in the interior of the leaf, a case which is common in true pines. In some species the diameter of these cells is equal to that of the epidermis cells; in some it is smaller, and in a very few larger. Their presence, distribution, and relative size, is tolerably constant, and furnishes good specific characters.

I do not describe the parenchymatous cells containing chlorophyll, nor their variety the so-called pallisade cells (elongated cells perpendicular to the upper side of the leaf), as no essential characters are derived from them. But of great diagnostic importance are the resin ducts, of which there are always two in the *Abies* leaf, readily seen in a horizontal section. In some species they are placed on the lower side of the leaf, close to the epidermis and mostly near the edges; in others we find them in the parenchyma, about equidistant from the upper and lower surface.

The fibro-vascular bundle occupies the centre of the leaf either single (in the more square leaves of the 4th section), or mostly divided in two distinct bundles (in the flat leaves). Both cases occur sometimes in the same species. The bundles show the larger (ligneous) cells above and the smaller (bast-) cells below; they are surrounded by small pith-like cells, and the whole separated from the parenchyma by a sheath of larger cells.

On the differences of the leaf-structure we can base the subdivisions of the genus with much greater certainty than on the length of the bracts, as was formerly done.

SEC. I. BALSAMEÆ: Resin ducts within the parenchyma, in the interior of the leaf; leaves on lower branches notched, and mostly without stomata on the upper side, on fertile branches entire, obtuse, or often acute, mostly with a few or more stomata above, towards the tip.—Two eastern and one northwestern species.

\* *Exserta*: bracts protruding, recurved.

1. *A. Fraseri*.

**\*\* *Inclusa*:** bracts shorter than the scales.

2. *A. balsamea*.

3. *A. subalpina*.

**Sec. II. GRANDES:** Resin ducts close to the epidermis of the lower side, towards the edges; leaves on lower branches notched or obtuse; on upper obtuse, rarely ever acute; bracts enclosed.—Two western species.

4. *A. grandis*.

5. *A. concolor*.

**Sec. III. BRACTEATÆ:** Resin ducts as in last; upper side of the rigid, mostly acute, leaves without stomata, with a continuous layer of hypoderm cells, usually similar cells within the sheath of the fibro-vascular bundle; pallsade-parenchyma very strongly developed; bracts exsert.—A Mexican and a southwestern species.

6. *A. religiosa*.

7. *A. bracteata*.

**Sec. IV. NOBILES:** Leaves of the adult tree and especially of the fertile branches quadrangular, short, curved, but scarcely twisted; resin ducts close to the epidermis of the lower side, and equidistant from the edge and keel; fibro-vascular bundles single; stomata on both sides; leaves of young trees much like those of Sec. II.—Two species of the higher mountains of the Pacific slope.

**\* *Exserta*:** bracts protruding.

8. *A. nobilis*.

**\*\* *Inclusa*:** bracts shorter than scales.

9. *A. magnifica*.

**I. A. FRASERI** (*Pinus*, Pursh. Fl. 2, 639, 1816; Parlatore in DC. Prod. 16, 2, 419), Lindl. Pen. Cyc. 1, No. 5 (1833), Forbes, Link, etc. This is probably the most local species in the United States, being confined to the tops of the highest mountains of North Carolina, which have an altitude of 6,000 feet or more, and the tops of which it covers together with some *Picea nigra*, but it never occurs mixed with the following species.—A small tree rarely as much as 30 or 40 feet high, and 12 or 18 inches in diameter, probably never more than 60 to 75 years old, with cinnamon-brown smoothish bark; readily distinguished from *balsamea* by the shorter, more oval cones with largely exsert and reflexed bracts, and always, even when sterile, by the almost uninterrupted stratum of hypodermic cells on the upper side of the leaf, more crowded on the edges. The white bands on the under side of the leaf consist usually of 8 or 10, or even 12 series of stomata; height of scales (without the stipe) equal to one-half or two-thirds their width; length of seeds equal to length and width of wing.—Forms of the next species with exsert tips of bracts, in the mountains of Pennsylvania, Vermont, and other northern regions, seem to have been mistaken for this species. In eastern as well as in European gardens forms of *balsamea* are often cultivated under the name of *Fraseri*.

2. *A. BALSAMEA* (*Pinus*, Lin. sp. pl. 1421, 1753; Parl. l. c. 423), Marshall Arb. Am. 102, Link, etc. *A. balsamifera*, Michx. Fl. 2, 207, in part. —The northeastern "Balsam" extends from Canada and the northeastern States along the mountains to Virginia, and along the Great Lakes to and beyond the Mississippi. It is a larger tree than the last, often 70 feet high, 1½ feet in diameter, and up to 150 years old; bark smooth and reddish-gray when young, brown and much cracked in old trees. Its slenderer cones with enclosed bracts (only their points sometimes protruding), and especially the leaves with scarcely any hypoderm cells above and very few on edges and keel (fewer than in any other of our species and sometimes none) and with narrower bands of stomata below (of 4-8, usually about 6 series), readily distinguishes it. *A. Hudsonia* of the gardens, often considered as a form of *Fraseri*, is a sterile dwarf form of *balsamea*, found also on the White Mountains of New Hampshire above the timber line.

3. *A. SUBALPINA*, Engelm. in Am. Naturalist, 1876, p. 554. *A. lasiocarpa*, Hook Fl. B. A. 2, 163. ? *A. bifolia*, Murr. Proc. R. Hort. Soc. 3, 318. *A. amabilis*, Parl. l. c. 426, in part. —Closely allied to the last species, the western representative of which it must be considered to be; it extends from the higher mountains of Colorado and the adjoining parts of Utah northward to Wyoming and Montana, where it is the only species, and westward to the mountains of Oregon and into British Columbia (Fraser's River) and southward probably to Mount Shasta, always scattered in the subalpine forests, and, at least in Colorado, coming up almost to the timber line, but never alone constituting forests. It is a larger tree than *balsamea*, often over 2 feet in diameter and 60-100 feet high, with thin, pale whitish, smooth bark, which only in very old trees becomes cracked and ashy-gray; timber so poor and soft that in some parts of the Rocky Mountains it is called pumpkin pine. Leaves like to those of *balsamea*, notched on sterile and pointed on fertile branches; hypoderm considerable, though interrupted on upper surface, crowded on edges and keel. Cones retuse, brown-purple, 2-3½ inches long, 1-1½ inches in diameter, the smaller ones near the timber line. Scales rounded or almost square, often almost as high as broad, similar in their proportions to those of *balsamea*, but larger; bracts short, emarginate, mucronate; seeds, including the wing, over 1 inch long, the latter nearly twice as long as it is wide.

Var. *FALLAX* has the resin ducts of this species, but the foliage almost of *concolor*; leaves sometimes 1½ or even 1¾ inches long, mostly obtuse, and covered with stomata above, glaucous when young.—Dr. Newberry's specimen in the Herb. Agricult. Dep. Washington, collected on the higher tops of the Cascades, south of the Columbia River, and described\* by him as *A. amabilis* in Pac. R. Rep. 6, bot. 51, belongs here; the loose scales (12

\* His description of the foliage, however, seems to refer to what I call below *A. grandis* var. *densifolia*. Dr. N. may have mixed both forms, an unfortunate mishap which is by no means rare in such collections, mostly made in haste and often under unfavorable circumstances.

lines wide, 11 high, with pointed bracts, seed with narrow wings, as in the species, but larger) brought home, indicate a large cone, such as he describes as 6 inches long and  $2\frac{1}{2}$  thick. S. Watson and lately A. L. Siler collected a similar form on the Wasatch Mountains; but the loose broad scales sent by the former may possibly belong to *concolor*, which grows in the same region. The mere fragments of this interesting form, seen by me, do not permit me to give more than the above indications.

This species has troubled botanists considerably. It is probable that Hooker's *lusiocarpa* belongs here, as a branchlet together with a few scales, preserved under that name in the Kew Herbarium, seems to point out; but the description in the Flor. B. A., which mentions the leaves as the longest of any N. A. *Abies*, refers perhaps to something else, and has certainly given cause for the application of the name to the long-leaved forms of *concolor* in the English nurseries. Then, in 1863, A. Murray distinguished a form of this species, collected by Lyall in British Columbia and on the Upper Columbia River, as *A. bifolia*, recognizing the different forms of foliage, but misapplying the scientific name. About the same time specimens and seeds from Colorado were distributed by Dr. Parry and by E. Hall as *A. grandis*, and may now be cultivated as such in Europe. That Parlatore and others have taken it for *amabilis* has already been stated.

4. *A. GRANDIS* (*Pinus*, Douglass Mss., 1830, and in Bot. Mag. Comp. 2, 147, 1836; Parl. l. c. 427), Lindl. Pen. Cyc. n. 3 (1833), Link, etc.—This is one of the tallest firs known and therefore properly named *grandis* by Douglas, a tree up to 200 and frequently 240 (Nuttall) or even 300 feet high (E. Hall), but in diameter less than some others, perhaps not more than 4 feet; bark smooth and brownish (Nuttall); wood white, soft, and coarse: a native of the litoral regions of the northwest coast, from Cape Mendocino in California, *Bolander*, *Vasey*, which seems to be the southern limit of several northern trees, to the British Possessions (in Vancouver's Island as *A. Gordoniana* Carr.) at least as far north as Fraser's River, *Jeffrey*, *Lyall*. But, common and valuable as this timber tree is in Oregon, very little information about it has reached us, and its cones seem to be almost unknown in collections.—The foliage is glossy green, without stomata above, and with 2 well marked white bands, each of 7–10 rows, below; leaves mostly 1–2 inches long, more markedly distichous, at least in the sterile branchlets, than in most other of our species, strongly grooved and notched; leaves on the fertile branchlets similar but rather shorter, and occasionally rounded at tip. The hypoderm cells are scattered all over the upper surface of the leaf, forming an interrupted stratum under the epidermis; on the sides and keel they are, mostly, only moderately developed. Cones cylindric, 2–4 inches long, with broad scales (nearly twice as broad as they are high), and short, bilobed or 2-auriculate bracts, with or without a short mucro. Seeds with a broad, very oblique wing, almost as broad as it is long.

This species is cultivated in European gardens from Douglas' seeds, sent home 45 years ago; in the Edinburgh bot. garden under its proper

name, in Dropmore Park as *A. amabilis*; but, though now over 40 years old, seems not to have coned yet. In the same establishments another fir is cultivated, in Edinburgh as *amabilis*, in Dropmore as *grandis*, thus continuing the confusion which has existed from the first in regard to these names. I suspect this to be the real *amabilis* of Douglas, but take it for a variety of *grandis*, which—Douglas' name being doubtful—may be designated as:

Var. *DENSIFOLIA*: Foliage denser than in the species, clustered on the upper side of the branches like that of *Nordmanniana*; leaves dark glossy green above, with 2 very conspicuous white bands below; hypoderm cells more crowded under the upper surface of the leaf; cones and seeds the same.—Apparently a mountain form of *grandis*, from the base of Mount Hood, E. Hall, mixed with *subalpina*, to British Columbia, Lyall. Douglas found his *amabilis* in September, 1825, "on the mountains immediately south of the Grand Rapids of the Columbia," together with *A. nobilis*; but the cone sent home by him (at that time or later?) was a much larger one, 5-6 inches long, 2½-3 thick, with lanceolate bracts; from its seeds the above-mentioned trees are said to have sprung. Unfortunately the large cone, figured by Lambert as *grandis*, and by Loudon and in Pinet. Woburn, as *amabilis*, and formerly preserved in the collection of the London Horticultural Society, seems to have been lost since the sale of that collection; it may have been similar to Newberry's cone of *fallax*, described above.

The following species have been claimed for *amabilis*: *A. subalpina* is called so by Parlature l. c., who seemed to rely on its native locality and on its leaves (or many of them) being entire, but overlooks other characters.—Var. *fallax* of that species, taken for *amabilis* by Newberry, has a large cone and similar bracts, but is not in cultivation, as Douglas' tree is supposed to be.—*A. magnifica*, the *amabilis* of the Californian botanists, has the large cones, the lanceolate bracts, and the entire leaves, claimed for *amabilis*; but the foliage is quite different, and so is its locality.—*A. nobilis*: Prof. McNab finds the leaves of the type specimen of *amabilis* in Herb. Kew identical with *nobilis* leaves; I have examined the same leaves and take them with scarcely a doubt for those of a form of *grandis*.—*A. concolor* has been named *amabilis* in some gardens.—Locally the "yellow fir" of Oregon, as *Pseudotsuga Douglasii* is often called, seems to have been also taken for *amabilis*, perhaps on account of its entire leaves.—There remains only the tree which I have designated as *A. grandis* var. *densiflora*, which, together with *grandis* itself, is the only western *Abies* (*nobilis* excepted) which has sprung from Douglas' Oregon seeds. No *subalpina*, *magnifica* or *concolor* has been in cultivation longer than the modern knowledge of California extends back and the influx of English seed collectors, beginning with Jeffrey in 1851. None of these species, then, can be Douglas' *amabilis*, but every consideration points to the tree cultivated under that name in Edinburgh. Prof. McNab has come to the same conclusion, but differs from me in considering it a distinct species. Fur-

ther exploration of the Cascade Mountains between the Columbia River and Shasta, probably the least known mountain region of the Pacific coast, will, it is hoped, clear up these doubts.

5. *A. CONCOLOR* (*Pinus*, Engelm. in Herb. 1848; Parl. l. c. 426) Lindl. Mss. in Gordon Pin. 155, 1858. Long known only from Fendler's New Mexican specimens No. 828, coll. 1847, this elegant species now proves to be wide-spread over the southern Rocky Mountains, from Pike's Peak in Colorado, where it occurs only in the valleys of the foothills, to the higher mountains of New Mexico, the southern parts of Utah, and the northern of Arizona, and throughout the Californian sierras, at an elevation of 3-7,000 feet, to Mount Shasta; whether in the southern Cascades, is not known. It is *A. Lowiana* Gord. suppl. 53; *A. grandis* of the Californian botanists; *A. lasiocarpa* of the nurseries (so called from its long leaves, which constitute a character of the original *lasiocarpa*); *A. amabilis* of some establishments (because of the large cones and obtuse leaves); *A. Parsoniana* of the gardens. It is a stately tree, in California up to 150 feet high, 3-5 feet in diameter, and 200-300 years old (Lemmon); in the Rocky Mountains not quite so large.—The bark is pale in young trees, but darker than in *subalpina*, and soon becomes rough and of an ash-gray color, in old trees often several inches thick and deeply fissured. The wood is more valuable than that of *subalpina*, perhaps equal to that of *grandis*, but much less so than the wood of *magnifica*. The tree is always readily distinguished by its pale glaucous foliage, which at last gets dull green, and by the length of the leaves of the young trees, 2-2½ and sometimes even 3 inches long—longer than in any other of our firs. Only such leaves or those of the lower branches of old trees are notched at the end; on the older trees they are shorter, very broad, convex above, usually falcate, and always obtuse; on the flowering branches they become often quite thick, keeled above, and almost quadrangular. On older trees stomata cover the upper surface; in young ones they are usually confined to the middle line of the leaf, but are never absent. Hypoderm cells are interruptedly distributed over the upper surface. Cones oblong, 2-4 or even 5 inches long, retuse, or in some trees short-pointed; usually apple-green before full maturity, but, at least in Colorado, varying to different shades of brown or purple.\* The scales are very broad in proportion; the bracts short, rounded, or truncate, or sometimes emarginate, with, or rarely without a short mucro; wing of seed broad, as wide as it is long; cotyledons 5-7, usually 6.

6. *A. RELIGIOSA* (*Pinus* H. B. K. n. gen. sp. 2, 5, 1817; Parl. l. c. 420) Schlecht. Linnæa 5, 77, 1830.—On the higher lands in Mexico, extending to Guatemala. A tall tree with linear, acute, or rarely obtuse, dark, glossy leaves; cones oval-oblong, 3-5 inches long, 1½-2 thick; bracts more or less

\* The color of the cones is often considered as of specific value, but in the Black Forest of Germany all the shades between light green and deep purple may be seen on the cones of *A. pectinata*, just as in our *concolor* in Colorado.

protruding, acute or cuspidate; scales one-third wider than they are high; seed-wings longer than wide; cotyledons 5.—*A. hirtella* (*Pinus*, H.B.K. ib. is scarcely a variety.

7. *A. BRACTEATA* (*Pinus* Don in Trans. Lin. Soc. 17, 443, 1837; Parl. l. c. 419) Nutt. Sylv. 3, 137, 1849. *P. venusta* Dougl. Bot. Mag. Comp, 2, 152, 1836.—A well marked, but little known tree, of very limited geographical distribution, being confined, as far as known, to the Santa Lucia Mountains in Southern California, though other localities in different parts of California are attributed to it by seed dealers, and having been gathered only by very few collectors.—Leaves linear-lanceolate, always acute, of very firm texture. The bract is scarcely longer than the somewhat rounded, glabrous (all the other firs have pubescent ones) scale, but its awn or midrib protrudes 1-1½ inches; wing of seed rounded.

8. *A. NOBILIS* (*Pinus* Dougl. Comp. Bot. Mag. 2, 147, 1836; Parl. l. c. 419) Lindl. Penn. Cyc. 1, No. 5. *Pseudotsuga nobilis* Bertrand, McNab, under *Pinus*: the red fir of the Cascades in Oregon, extending southward to the Shasta region of California; stately trees, 200 feet high, with rigid, glaucous foliage; thick, rough, cinnamon-brown bark, and useful timber. A section in the Oregon collection of the Centennial Exhibition was taken from a tree 2½ feet in diameter, bark 1 inch thick, 119 annual rings of nearly even thickness throughout. The leaves of young trees and of the lower sterile branches of old trees are longer, flat and grooved, the resin ducts lateral, and the fibro-vascular bundles more or less divided in two; those of the fully developed and especially the fertile branches are shorter, flat-quadrangular, their thickness not more than ¼ or rarely ⅓ of the width;\* bundles single, cylindrical. Bracts more or less protruding and reflexed; scale high in proportion to its width (7:10); the oblique, angular wing of the seed about as wide as long and as long as the slender seed; the only good seed I could examine had 7 cotyledons.

9. *A. MAGNIFICA* Murray Prov. Hort. Soc. 3, 318, 1863; *A. nobilis* var. *robusta* in Hort. Dickson & Turnbull; *A. campylocarpa* Murr. Trans. Bot. Soc. 6, 370; *A. amabilis* of the Californian botanists; *Pseudotsuga magnifica* McNab: the red fir of the higher California sierras, at an altitude of 7-10,000 feet; large trees often 10 feet in diameter, over 200 feet high, with thick cinnamon-brown bark, and valuable wood.† Leaves of young specimens flat but scarcely grooved, never, I believe, notched, the fibrous bundles often in twos. On full-grown trees, and especially on fertile branches, the leaves are mostly ¼ wider than thick, or even perfectly square; the resin ducts in these leaves are placed equidistant from the edges and the keel, separated from the epidermis by a layer of hypoderm

\* The leaf sections, figured by McNab, all seem to refer to young trees; none are as thick as I find them in native specimens.

† A section in the Agricultural Dep. of Cent. Exh., sent by J. G. Lemmon, indicates a tree 6½ feet in diameter, with brown, almost fibrous, bark, 3 inches thick, about 400 years old, with a pretty uniform growth, 10 rings measuring 1-2 inches in thickness, about the same as in a specimen of *nobilis* in the Oregon collection.

cells, which is externally indicated by a green stripe dividing the bands of stomata, so that these leaves show 4 lower white bands. Cones 6-8 inches long, 2½-3½ thick, purple; bracts lanceolate, shorter than the broad scale (height to width as 6:10); wing of slender seed very oblique, wider than long; the only seed examined had 10 cotyledons.

Many years ago it was suggested by Mr. McNab of the Edinburgh garden, that *nobilis* and *magnifica* might be forms of the same species; some seedsmen of California seem, also, to have come to this conclusion; and now Messrs. Hooker and Gray, who a few months ago enjoyed the opportunity of examining both on their native mountains, incline to the same opinion; *magnifica* would thus be the southern, short-bracted, and *nobilis* the northern, long-bracted form. It is quite probable that the length of the bracts may vary; we know it of *nobilis*, but it is doubtful whether this could be the case to such an extent as to permit us to unite both species. In *magnifica* no lengthening of the bracts has been observed thus far, and in *nobilis* they never, I believe, become shorter than the scale. But besides this, I confess, rather doubtful difference in the length of an organ of minor importance, the flatter and grooved leaves of the young *nobilis*, and the higher and proportionately narrower scales of this species, together with the smaller number of cotyledons (if constant), seem to indicate specific distinction. Further explorations must show whether *magnifica*, or anything like it, grows in the regions which we know as the home of *nobilis*.



